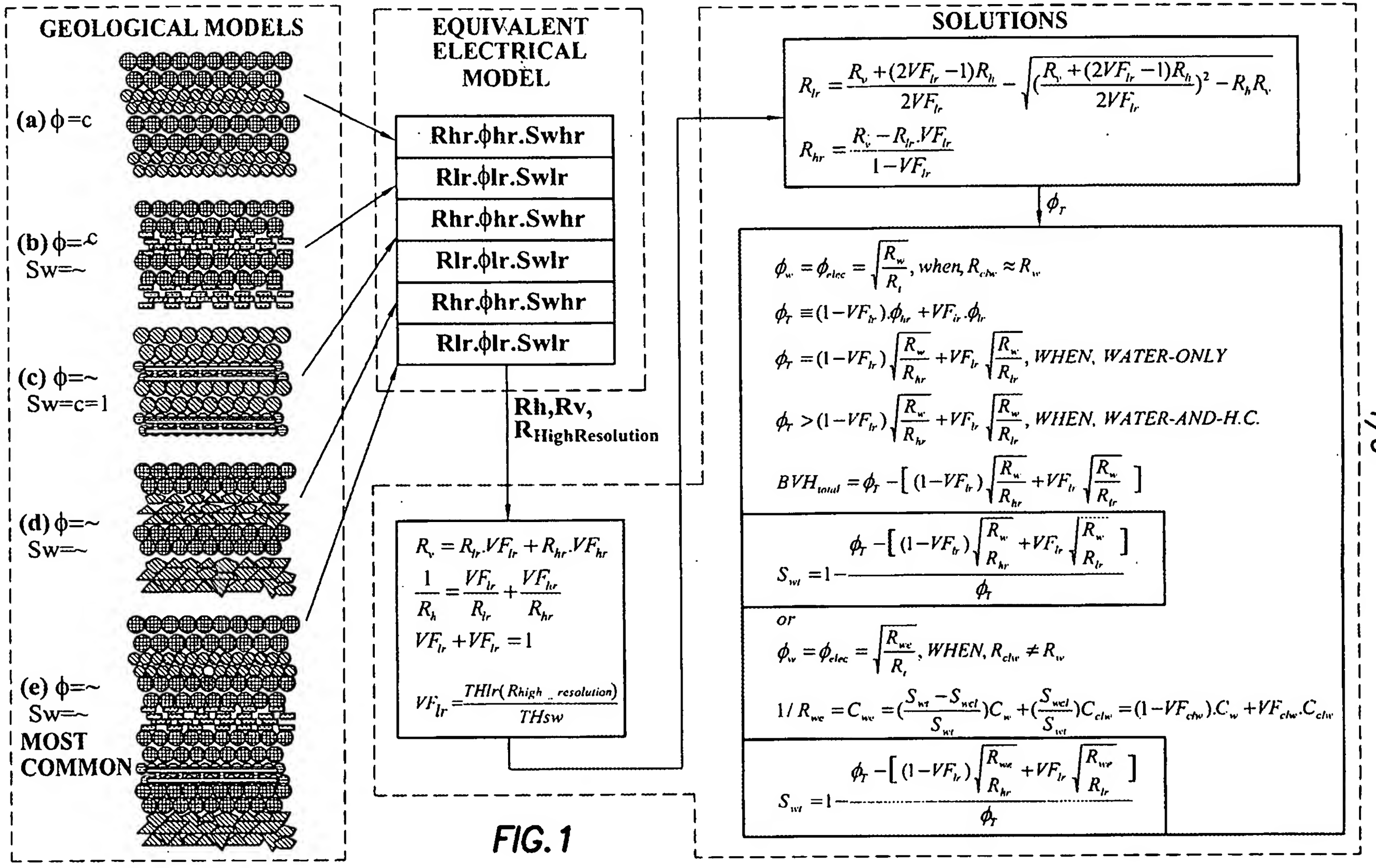
GEOLOGICAL MODELS
(a) ϕ=c
(b) ϕ=c
Sw=~
(c) ϕ=~
Sw=c=1
(d) ϕ=~
Sw=~
(e) ϕ=~
Sw=~
MOST
COMMON
EQUIVALENT
ELECTRICAL
MODEL
Rhr.ϕhr.Swhr
Rlr.ϕlr.Swlr
Rhr.ϕhr.Swhr
Rlr.ϕlr.Swlr
Rhr.ϕhr.Swhr
Rlr.ϕlr.Swlr
Rh,Rv,
R HighResolution
$R_v = R_{lr}.VF_{lr} + R_{hr}.VF_{hr}$
$\frac{1}{R_h} = \frac{VF_{lr}}{R_{lr}} + \frac{VF_{hr}}{R_{hr}}$
$VF_{lr} + VF_{lr} = 1$
$VF_{lr} = \frac{THlr(R_{high\ resolution})}{THsw}$
SOLUTIONS
$R_{lr} = \frac{R_v + (2VF_{lr} - 1)R_h}{2VF_{lr}} - \sqrt{(\frac{R_v + (2VF_{lr} - 1)R_h}{2VF_{lr}})^2 - R_h R_v}$
$R_{hr} = \frac{R_v - R_{lr}.VF_{lr}}{1 - VF_{lr}}$
ϕ_T
$\phi_w = \phi_{relec} = \sqrt{\frac{R_w}{R_t}}$, when, $R_{clw} \approx R_w$
$\phi_T \equiv (1 - VF_{lr}).\phi_{hr} + VF_{lr}.\phi_{lr}$
$\phi_T = (1 - VF_{lr})\sqrt{\frac{R_w}{R_{hr}}} + VF_{lr}\sqrt{\frac{R_w}{R_{lr}}}$, WHEN, WATER-ONLY
$\phi_T > (1 - VF_{lr})\sqrt{\frac{R_w}{R_{hr}}} + VF_{lr}\sqrt{\frac{R_w}{R_{lr}}}$, WHEN, WATER-AND-H.C.
$BVH_{total} = \phi_T - [(1 - VF_{lr})\sqrt{\frac{R_w}{R_{hr}}} + VF_{lr}\sqrt{\frac{R_w}{R_{lr}}}]$
$S_{wt} = 1 - \frac{\phi_T - [(1 - VF_{lr})\sqrt{\frac{R_w}{R_{hr}}} + VF_{lr}\sqrt{\frac{R_w}{R_{lr}}}]}{\phi_T}$
or
$\phi_w = \phi_{elec} = \sqrt{\frac{R_{we}}{R_t}}$, WHEN, $R_{clw} \neq R_w$
$1/R_{we} = C_{we} = (\frac{S_{wt} - S_{wcl}}{S_{wt}})C_w + (\frac{S_{wcl}}{S_{wt}})C_{clw} = (1 - VF_{clw}).C_w + VF_{clw}.C_{clw}$
$S_{wt} = 1 - \frac{\phi_T - [(1 - VF_{lr})\sqrt{\frac{R_{we}}{R_{hr}}} + VF_{lr}\sqrt{\frac{R_{we}}{R_{lr}}}]}{\phi_T}$

FIG. 1

1/3

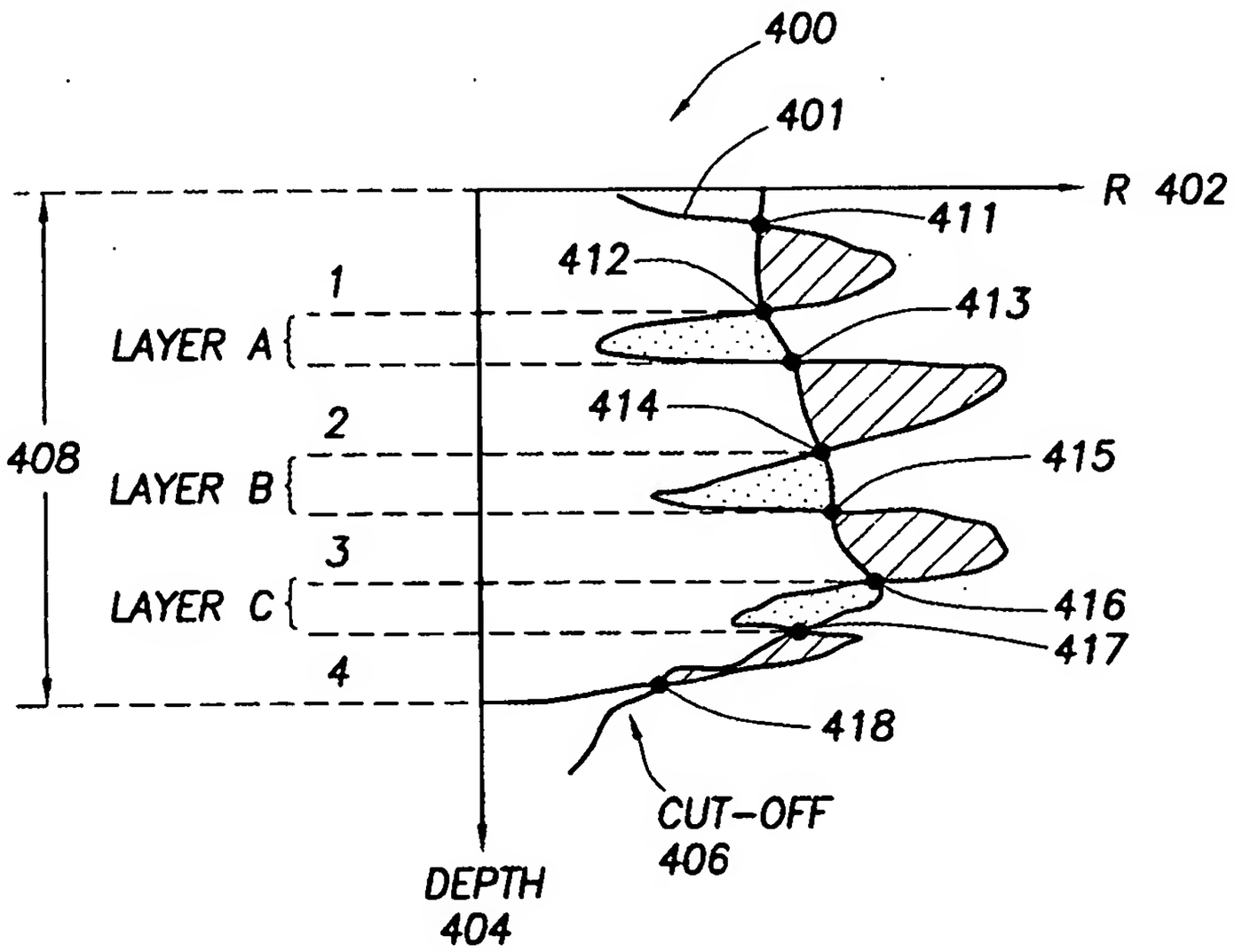
400
401
R 402
411
412
413
414
415
416
417
418
1
LAYER A
2
LAYER B
3
LAYER C
4
408
CUT-OFF
406
DEPTH
404

FIG.2

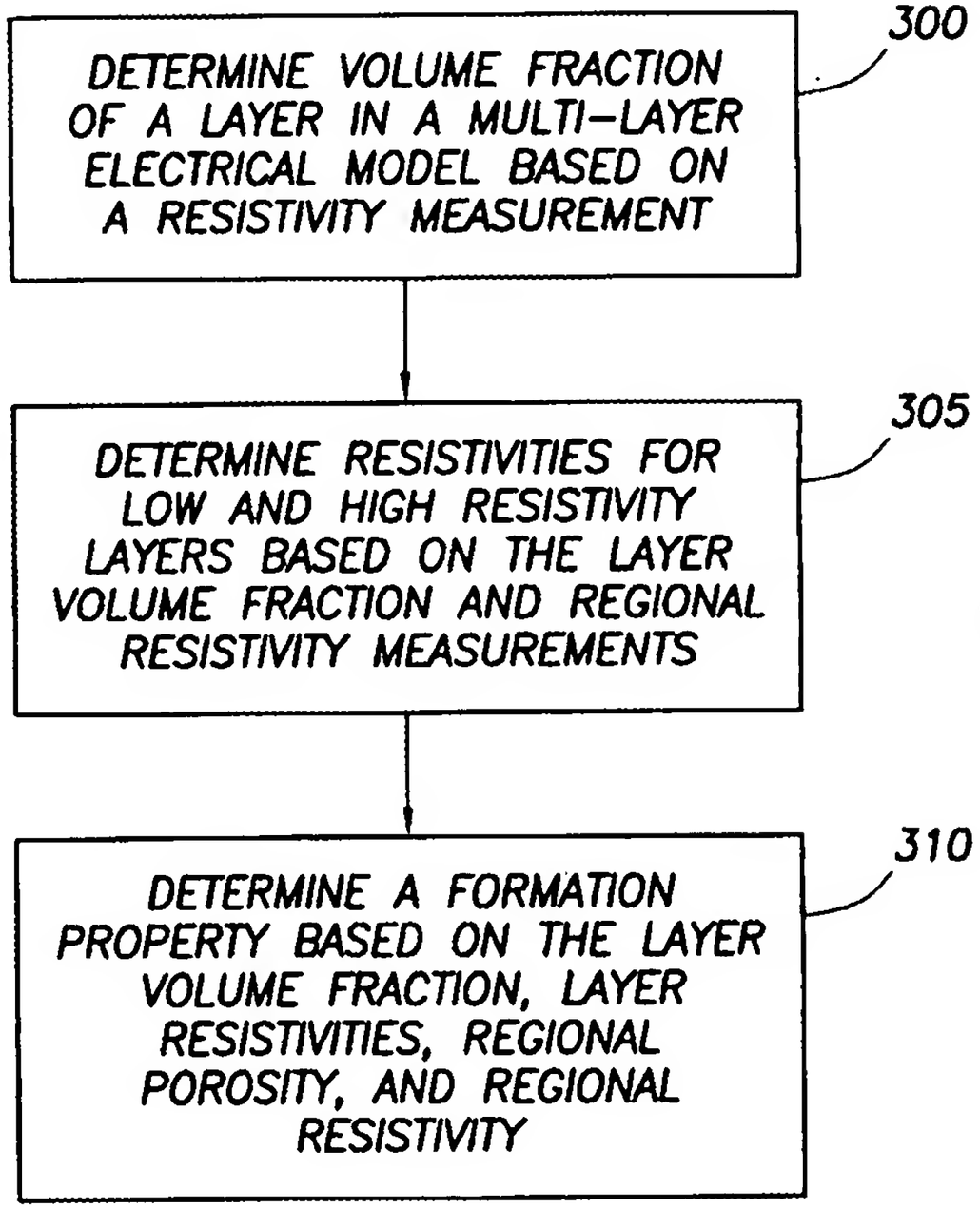
DETERMINE VOLUME FRACTION OF A LAYER IN A MULTI-LAYER ELECTRICAL MODEL BASED ON A RESISTIVITY MEASUREMENT
300
DETERMINE RESISTIVITIES FOR LOW AND HIGH RESISTIVITY LAYERS BASED ON THE LAYER VOLUME FRACTION AND REGIONAL RESISTIVITY MEASUREMENTS
305
DETERMINE A FORMATION PROPERTY BASED ON THE LAYER VOLUME FRACTION, LAYER RESISTIVITIES, REGIONAL POROSITY, AND REGIONAL RESISTIVITY
310

FIG.3

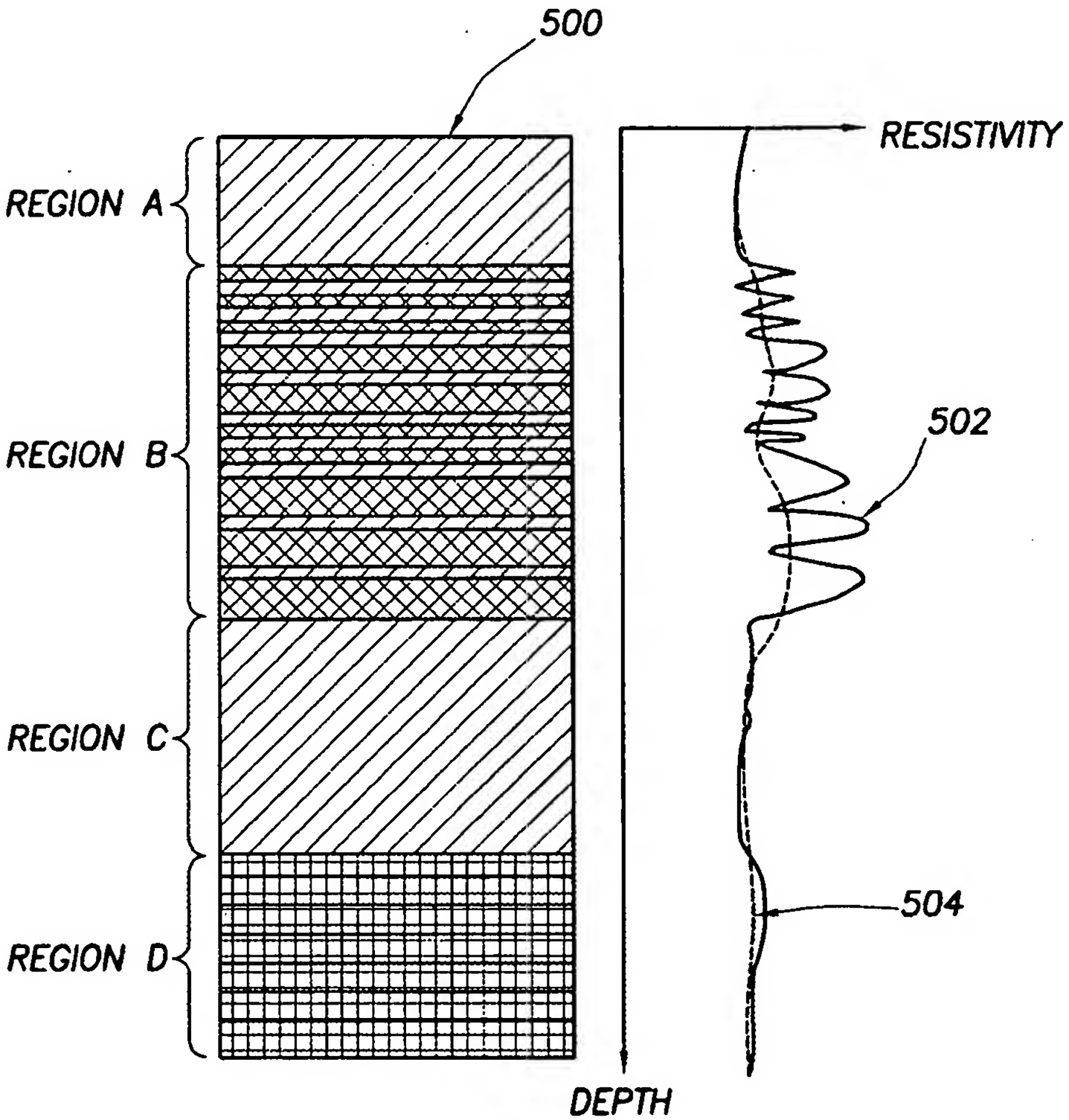

FIG.4

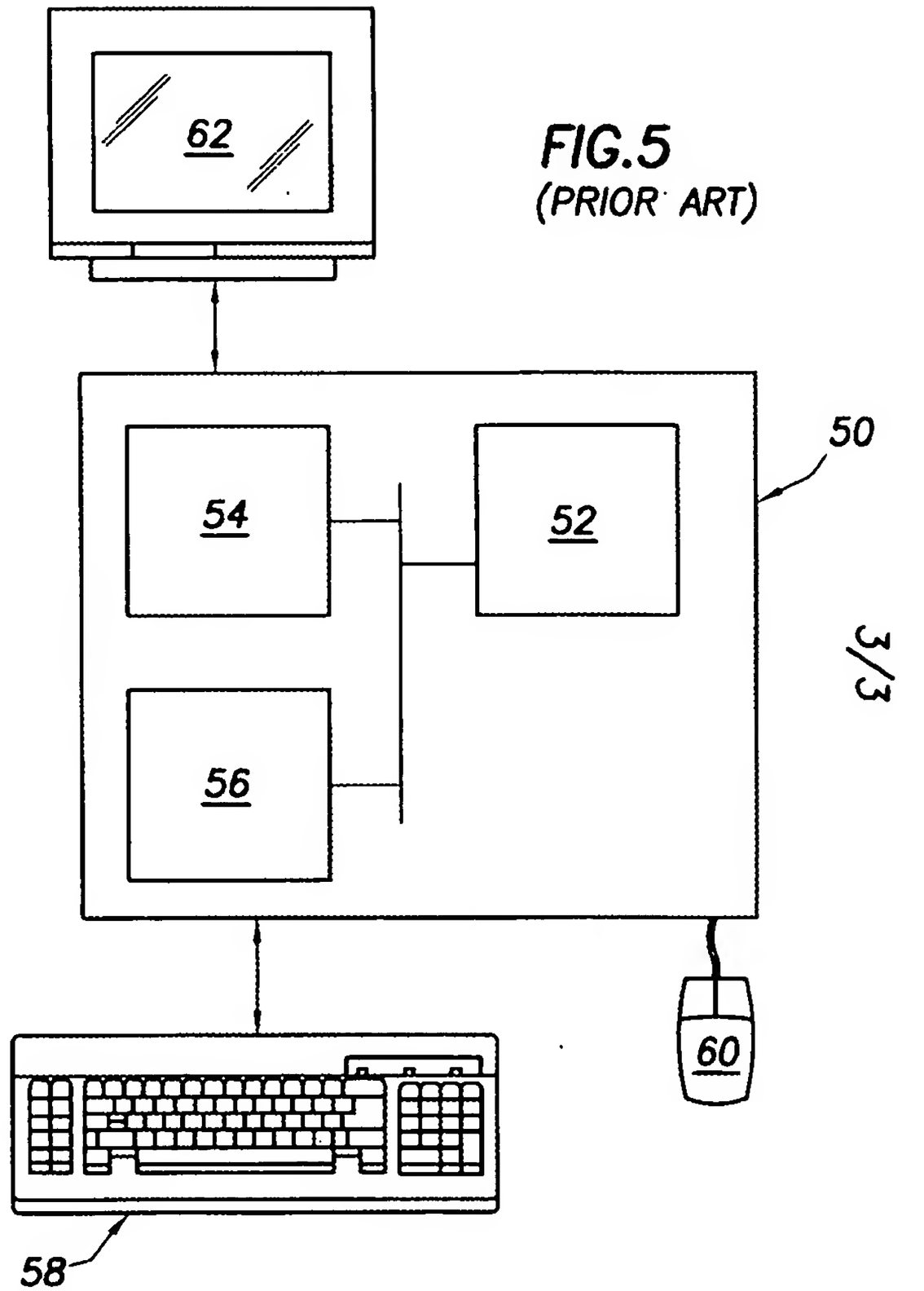

FIG.5
(PRIOR ART)